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A Primer on Distributed-Connected Generation in Canada By Sumit Sood and Victor Gallardo

The Electric Power Research Institute (EPRI) defines a Distributed Energy Resource (DER) as an electricity supply source interconnected to the electric grid, in an approved manner, at or below 69kV medium voltage, and that fulfills one of the following criteria (EPRI 2015):

- 1) Generates electricity using any primary fuel source
- 2) Stores energy and can supply electricity to the grid from that reservoir
- 3) Involves load changes undertaken by end-users in response to price or other inducements

Borrowing from EPRI's DER definition, this article focuses on Distributed-Connected Generation (DCG) and defines it as an electricity source with an attribute of being environmentally friendly, located near or at the point of consumption, and has an electric output small enough that the system does not need to connect to the transmission system. Instead, it connects directly into the electric distribution system.

This article provides a summary overview of the current state of DCG in Canada and highlights some of the policy and economic barriers and enablers present in each province.

British Columbia

The Ministry of Energy and Mines is responsible for the electricity, mining and mineral exploration sectors. The Ministry is also responsible for British Columbia Hydro and Power Authority (BC Hydro) and Columbia Power Corporation. BC Hydro, the largest utility in the province, also functions as the provincial Balancing Authority.

The promotion of DCG in BC began in 2002 when the provincial government launched its *2002 Energy Plan: Energy for our Future: A Plan for BC* (Cohen and Calvert 2012). In this plan, BC Hydro was directed to develop policies such as Net Metering to promote the voluntary goal of acquiring 50% of new electricity supply from renewable sources. In 2008, BC Hydro introduced its Standing Offer Program (SOP) to encourage the growth of DCG systems with a capacity between 100 kilowatts (kW) and 15 megawatts (MW) (BC Hydro 2008). In line with this program, the government launched the Micro-SOP program in 2014, with the purpose of promoting DCG projects (capacity between 100kW and 1MW) within First Nations communities.

Since the launch of the Net Metering program, BC Hydro has processed over 1,300 customers, with over 95% of these customers opting for solar photovoltaics (SPV) (BC Hydro 2019b). As of 2018, the province had contracted over 170MW of capacity under the SOP programs; the original target was 100MW (Ministry of Energy, Mines and Petroleum Resources 2018). The SOP and Micro-SOP programs were suspended due to concerns about the future costs associated with the oversubscribed contracted capacity and potential electricity rate increases (BC Hydro 2019a).

Alberta

The Ministry of Energy is responsible for the development of energy and mineral resources. The *Electric Utilities Act*, together with the *Hydro and Electric Utilities Act*, delineate the duties and obligations for the independent system operator (AESO) and the local utilities concerning the electricity market and transmissions.

In 2008, the Alberta government introduced the *Micro-Generation Regulation*, which opened the door for Albertans to be able to produce electric power for their consumption. The *Micro-Generation Regulation* prescribes net billing as the methodology used to compensate (charge) DCG customers for the electricity they deliver (draw) to (from) the distribution system.

The provincial government revised the *Hydro and Electric Energy Regulation* in 2013, intending to streamline the application process for small power plants and subsequently published guidelines for distributed-generation application processes (AUC 2013). In 2016, the provincial government amended the *Micro-Generation Regulation* to increase the size limit for DCG systems from 1 to 5MW. The amendments now allow DCG systems to serve adjacent sites, helping to promote the growth of these systems. The AESO reports that, as of November 2019, the total DCG installed capacity was about 54MW, with SPV systems accounting for about 90% of this capacity (AESO 2019).

Saskatchewan

Two key legislations govern Saskatchewan's electricity sector: *The Crown Corporation Act, 1993*, that empowers the provincial government to manage SaskPower; and *The Power Corporation Act*, that grants SaskPower the right to be the sole supplier of electricity in the province.

In 2007, SaskPower introduced the Small Power Producer Program, which allowed small producers to generate up to 100kW for their consumption. This program was replaced by the Power Generation Partner Program in 2018, which increased the size of the DCG to 1MW of capacity. This program also includes carbon-neutral non-renewable technologies with up to 5MW of capacity. Currently, small power producers have a total capacity of 29MW (SaskPower 2019b).

SaskPower ran a successful net metering program that resulted in achieving the 16MW program cap two years earlier than anticipated. Concerns around excessive anticipated revenue erosion of SaskPower forced the government to suspend this program temporarily. A revamped net metering program was launched in November of 2019 with a less generous credit offered to customers (7.5cents/kWh vs. 14 cents/kWh during the first stage) (SaskPower 2019a). The net metering program allows all SaskPower consumers to install DCG projects of up to 100 kW capacity.

Manitoba

Manitoba Hydro is the provincial Crown Corporation that is responsible for the electric power and natural gas supply in the province. Manitoba Hydro-Electric Board and the *Manitoba Hydro Act* govern this Crown Corporation. Lastly, the Department of Growth Enterprise and Trade's Energy Division is responsible for developing the provincial energy framework, and for seeking economic development opportunities related to energy development and energy efficiency activities (NRCan 2015a).

In 2003, Manitoba Hydro published a guide called *Technical requirements for connecting distributed resources to Manitoba Hydro distribution system* (Government of Manitoba 2003), which set the regulatory framework to allow consumers produce their own electricity. Customers connecting DCG are subject to a net-billing rate structure. The compensation that DCG customers receive when delivering excess electricity to the system is lower than the price they pay when they draw electricity from it (Manitoba Hydro 2019).

Access to abundant hydroelectric resources allows residents of Manitoba to enjoy one of the lowest energy bills compared to all other residents across Canada, with an average bill of \$84/1000 kWh in Winnipeg vs. the Canadian mean of \$129/1000 kWh. Manitoba also has a much lower greenhouse gas (GHG) electricity generation intensity when compared to the rest of Canada (3.4 grams of GHG/kWh vs. the Canadian mean of 140grams of GHG/kWh) (CER 2017). Arguably, the main barriers to the growth of DCG in Manitoba are the low electricity costs combined with virtually zero dependence on carbon-based electricity generation (in 2016, 99.6% of its electricity came from hydroelectric generation).

Ontario

The Ontario Ministry of Energy is responsible for the legislative framework of the province's electricity system, and it has legislative responsibility for the Ontario Energy Board (OEB). The *Ontario Energy Board Act, 1998* outlines the mandate of the OEB.

In 2014, Ontario became the first jurisdiction in North America to phase out coal-fired electricity generation, and by 2015, 90% of their electricity was generated from renewable sources (NRCan 2015e). The Independent Electricity System Operator reports that as of June of 2019, the total DCG installed capacity in Ontario was about 3100MW, with SPV accounting for 68%. Customers connecting DCG into the system are subject to a net metering rate structure. Ontario also has a Feed-in Tariff (FIT) program for renewable generators with a capacity greater than 10kW (IESO 2018).

The overall policy direction is to keep supporting the growth of DCG within the province. In the *Strategic Blueprint Plan* (OEB 2017), the OEB declared its commitment to modernize its regulatory approach to keep pace with an evolving energy sector. In 2019, the agency initiated two integrated consultation processes to address some of the concerns around the growth of DCG: Utility Remuneration (OEB 2019b) and Responding to Distributed Energy Resources (OEB 2019a). Lastly, the OEB launched a review of the requirements to connect DERs, with the purpose to identify any barriers to the connection of new DER technologies and to standardize the process (OEB 2019c).

Quebec

The *Hydro Quebec Act* and the *Act respecting the Régie de l'énergie* are the two key legislations governing Quebec's electricity market. The former governs the province's electricity distribution company, Hydro Quebec, and the latter specifies the mandate and authority that the regulator, *Régie de l'énergie*, has to establish, monitor, and enforce a mandatory regime of reliability standards for electricity transmission. The ministère de l'Énergie et des Ressources naturelles is the ministry responsible for setting the policy and legislative framework for the electricity system within the province (NRCan 2015f).

In 2015, the Ministère de l'Énergie et Ressources naturelles released *The 2030 Energy Policy* (Government of Québec 2016) with the impetus to keep consumers at the forefront of impending initiatives such as DCG, primarily through geothermal and solar energy. Under this policy, the provincial government states its support to authorize consumers to become electricity autogenerators through a net metering rate option.

However, like Manitoba, access to abundant hydroelectric power has allowed Quebec residents to benefit from lower energy bills compared to the rest of Canada. Residents of Montreal pay the lowest residential average rate for electricity at \$72/1000kWh (Canadian mean of \$129/1000 kWh). Quebec has the lowest GHG electricity generation intensity in the country at 1.2 grams GHG/kWh (CER 2017). The affordability of electricity makes it difficult to justify investing in DCG equipment due to the long payback periods, while the low reliance on fossil-fuel energy provides the government no political incentives to promote the growth of DCG technologies.

New Brunswick

The New Brunswick Department of Energy and Mines is responsible for the overall provincial energy policy, including the administration of the provincial *Electricity Act*. This act gives the authorization to the New Brunswick Energy and Utilities Board to enforce and implement the mandate of the *Reliability Standards Regulation*. The *Electricity Act* also governs the New Brunswick Power Corporation (NB Power), which is the province's vertically integrated electric utility (NRCan 2015b).

In 2015, the provincial government introduced the *Electricity from Renewable Resources Regulation*, which regulates the Locally Owned Renewable Energy Projects that are Small in Scale Program (LORESS) (Government of New Brunswick 2016). The LORESS program directed NB Power to endeavour to obtain up to 80MW of renewable energy through different sub-programs. Included in these sub-programs are the Embedded Generation and Net Metering programs.

The Embedded Generation program allows locally owned small-scale renewable electricity generators (between 100kW and 3MW) to sell electricity to NB Power at a long-term fixed-price (FIT), with an initial maximum program allocation of 20MW. The Net Metering Program allows consumers to produce renewable energy out of small-scale generators (less than 100kW systems) for their consumption with the option to sell excess electricity back to NB Power. Customers under this program are subject to a net metering rate structure (Government of New Brunswick 2017).

Nova Scotia

The Nova Scotia *Public Utilities Act* provides the legal framework that Nova Scotia Power Incorporated (NSPower) operates within. NSPower is an investor-owned utility and is responsible for most of the provincial electric system (NRCan 2015d). A significant change in the legislative framework happened in 2013, when the government introduced the *Electricity Reform Act*, which enables final consumers to bypass the utility companies and purchase energy directly from renewable energy providers.

As part of Nova Scotia's 2010 *Renewable Electricity Plan*, the province introduced a community FIT program referred to as COMFIT (Government of Nova Scotia 2010). This program ran between 2011 and 2016, adding about 150MW of renewable generation installed capacity, with projects ranging between 0.05 and 7.05MW, all community-owned and connected into the distribution system (Department of Energy and Mines 2019).

Following the success of the COMFIT program, in their *2015 Electricity Plan: Our Electricity Future* (Government of Nova Scotia 2015) the province introduced two new programs promoting DCG: Solar for Community Buildings Pilot Program, and Enhanced Net Metering Program. The former offers long-term fixed-price contracts (20 years power purchase agreements) to those installing SPV systems in building (capacity less than 75kW). The latter promotes small-scale renewable generation (capacity less than 1MW) by offering a net-metering rate structure to these customers.

Newfoundland and Labrador

The Newfoundland and Labrador Department of Natural Resources is responsible for the legislative, regulatory, and policy functions related to the provincial energy industry. The *Public Utilities Act, R.S.N. 1990* governs the Board of Commissioners of Public Utilities (PUB). The PUB regulates the province's electric utilities, including Newfoundland Power (NP), which is a vertically integrated investor-owned utility that services 87% of the electricity consumers in the province (NRCan 2015c).

In 2007, the provincial government launched its *Energy Plan: Focusing Our Energy* (Government of NL 2015a), where the provincial environmental goals and energy policy were laid out. In this document, the government committed to developing a net metering policy to provide consumers with the

regulatory support to install DCG. It was until 2015 when the government launched the *Net Metering Policy Framework*, which allowed customers to install DCG with a capacity of up to 100kW. The intention of this policy was not to increase the mix of renewable energy, but rather to allow customers to offset their energy usage (Government of NL 2015b).

The province's current energy mix is 85% renewable. Once their Muskrat Falls hydroelectric project is completed (824MW), the province expects this percentage to be 98%. Further, the second phase of the Lower Churchill River development at Gull Island could bring an extra 2,250MW of hydroelectric capacity (Government of NL 2015a). Promoting the growth of DCG within the province is not a priority.

Prince Edward Island

The Department of Transportation, Infrastructure and Energy is responsible for coordinating and directing the overall provincial electricity policy. This department also administers the *Electric Power Act* and the *Energy Corporation Act*. Both acts regulate the energy industry within the province.

DCG had been allowed since the 1970's. However, with the introduction of the Net Metering program in 2004, laid out in the *Renewable Energy Act*, the government officially set the regulatory framework supporting the growth of DCG (Government of PEI 2004). Under this program, customers connecting DCG with a capacity of less than 100kW were offered a net metering rate structure. This act was amended in 2015 as the share of renewable generation grew from 86% to 99% between 2005 and 2015, with wind generation accounting for 98% of this generation.

The intermittency of wind generation has forced the province to become a net importer of electricity, which is reflected in the cost of electricity across the province. Residents of Charlottetown pay an average utility rate of \$160/1000kW.h, which is the second-highest in the country (Ontario is about \$178/1000kW.h) (CER 2017). In its *Energy Strategy*, launched in 2016, the province states that it will address the high cost of electricity by focusing on promoting energy efficiency and conservation, reducing internal demand, and increasing utility-scale solar and wind generation. The province is not actively seeking to promote further development and growth of DCG.

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